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STATEMENT OF THE COMMITTEE ON MILITARY ENVIRONMENTAL RESEARCH O--ETC(U)  
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STATEMENT OF THE  
COMMITTEE ON MILITARY ENVIRONMENTAL RESEARCH  
ON THE STATUS OF RESEARCH INTO  
BIOLOGICAL EFFECTS OF ENVIRONMENTAL CONTAMINANTS  
AT ROCKY MOUNTAIN ARSENAL

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National Academy of Sciences  
Washington, D.C.  
January 1977

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16. Abstracts This report deals with the U.S. Army Medical Research and Development Command (USAMRDC) charge to establish environmental quality standards for the reclamation and renovation of contaminated land areas at military installations, and the Committee on Military Environmental Research (MER) charge of evaluating the USAMRDC environmental research program and review the findings. During the U.S. Army's project of decontaminating the reservation at Rocky Mountain Arsenal, two contaminants - DIMP and DCPD - were detected in wells off the reservation. Toxicity investigations of these materials were promptly initiated, and acute and 90-day feeding studies were completed in the fall of 1976. The Committee comments on proposed temporary guidelines to be used until lifetime studies could be completed, and, in addition, makes recommendations for future studies concerning the food preference or avoidance in the wildlife investigations, decomposition rates and products in soils and water, and food chain accumulation in ruminants. The Committee also comments on priorities for studying six other contaminants which have been found or are suspected of being present.			
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This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

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## BACKGROUND INFORMATION

In 1972, the U.S. Army Medical Research and Development Command (USAMRDC) asked the Division of Medical Sciences of the National Research Council to establish a committee to render advice on their expanding environmental research program. In response, the Committee on Military Environmental Research (MER) was formed.

In April 1975, USAMRDC requested the Assembly of Life Sciences to constitute a special task force to assist the Committee in evaluating environmental quality standards research for the reclamation and renovation of contaminated land areas at military installations. The first installation considered was Rocky Mountain Arsenal (RMA), Colorado.

During the 1950s, wastes from both a nerve gas manufacturing plant and a leased pesticides facility were deposited in a dry pond at this base. Liquid wastes were disposed of in unlined basins from 1941-1955. From 1956 to present they have been put in an asphalt-lined basin. A 12,045-foot well was drilled in September 1961. Wastes were injected into it from March 1962 to February 1966, until an empirical correlation between injection fluid volumes and earthquakes resulted in the discontinuance of this practice. Chemical munitions were manufactured from 1941-1945, and 1950-1957. In 1975, the pesticide manufacturer began construction of a waste treatment system which is expected to be mechanically completed early in the first quarter of 1977. Start-up phase will follow with lined-out operation anticipated by the end of FY 77.

Diisopropylmethylphosphonate (DIMP) and dicyclopentadiene (DCPD), two compounds suspected of having leached into the soil from this disposal, have been isolated in ground waters off post.

The concentrations reported off post by the Colorado Department of Health, which has been monitoring wells, are: DIMP at boundary 2182 ppb - 3 1/2 miles, 60-160 ppb; 4 1/4 miles, 30-40 ppb; and 7 miles, 3 ppb. DCPD

has been found only adjacent to the northern boundary ranging from 1513 to 1320 ppb. Additional monitoring results are attached as Enclosure 1.

The Rocky Mountain Arsenal is located near Denver and consists of 17,084 acres of prairie land. It is bordered on the southwest by Commerce City, a suburb of Denver, by Stapleton Airport on the south, and by farms and rangeland on the east, north, and northeast.

One hundred ninety species of plants have been identified on the Arsenal, 24 mammals, and 190 birds. Predominant species of prairie vegetation are annual weedy types, native and domestic grasses (i.e., June grass, blue grama grass, and crested wheat grass, respectively). Most numerous mammals are deer mice, blacktail prairie dogs, and blacktail jackrabbits. Most numerous prairie birds are western meadowlark, lark bunting, and horned larks. The hawk and owl or raptorial (birds of prey) densities at the Arsenal cannot be equalled in other areas of the West.

A problem-definition study on DIMP and DCPD was conducted by USAMRDC, with the assistance of literature retrieval contractors, which indicated that there was not sufficient information on the toxicity of these compounds to man, wildlife, vegetation, aquatic life, or domestic animals to propose safe levels. USAMRDC then contracted for acute and subchronic toxicological investigations to determine the safe levels in mammals, vegetation, and aquatic life. The reports of these studies have been reviewed in detail by the MER Subcommittee on Land Renovation.

#### RESPONSIBILITY

The responsibilities of USAMRDC are to perform or contract for research which will help to establish standards to protect man and his environment.

The responsibility of the Assembly of Life Sciences-National Research Council is to evaluate the USAMRDC research program and review the findings.



#### INTERIM STATEMENT

In response to a request from USAMRDC for interim guidance, the Committee has reviewed in detail the U.S. Army's plans for continuing studies on the toxicology (for mammals, wildlife, and vegetation) of DIMP and DCPD.

Continuing studies should include the following:

1. Wildlife studies should include food preference or avoidance in sufficient detail to assess whether these factors could affect the data under field conditions.
2. The decomposition rates and products, under field conditions, of DIMP and DCPD, should be determined in soils and water.
3. To avoid inconsistencies in biological effects, a single batch of highly purified, chemically-characterized DIMP must be available for all further toxicity testing.
4. Because preliminary results were inconclusive, additional mutagenic screening tests should be undertaken.
5. The demyelination test with DIMP, where technical difficulties were encountered, should be repeated.
6. The ruminant study should determine whether cattle accumulate DCPD and DIMP, and whether this could be passed on through the food chain in meat or milk.

The Committee also has reviewed the Bioengineering Development Laboratory problem-definition study of the contaminants para-chlorophenylmethyl sulfide, sulfoxide, and sulfone, and the solvents benzene, toluene, and xylene. These substances originated from pesticide-manufacturing activities. Sulfide and sulfone have been detected in water in concentrations of 20 and 40 ppb, respectively, immediately north of the installation.



Because of lack of biologic and chemical data on the above three sulfur-containing compounds compared to available information and ongoing studies with the solvents, the Committee recommends that toxicologic studies on para-chlorophenylmethyl sulfide, sulfoxide, and sulfone be given higher priority than studies on benzene, toluene, and xylene for which information is available.

The Committee was asked to comment on the interim, temporary guidelines for DIMP and DCPD in food and water. Recognizing that the data are incomplete, the Committee concurs with the temporary guidelines of 0.5 ppm for DIMP and 1.3 ppm for DCPD proposed by USAMRDC as the maximum concentrations allowed in food and water for human consumption. These figures are based on dietary no-effect levels of 300 ppm (equivalent to 30 mg/kg body weight) for DIMP and 750 ppm (equivalent to 75 mg/kg body weight) for DCPD derived from 90-day rat studies, assuming that a 60-kg person ingests an average of 1,500 grams food and 2,000 milliliter water per day and applying a 1,000-fold safety factor.

These guidelines should be reviewed as additional data become available.

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Well Location	DMP CONC. ppb	DCPD CONC. ppb	Remarks
2 miles North 112th & Chambers Road	< 0.5	0 (odor)	July 20 results, well 25' deep, Sec 7
1/2 mile North South of Highway 2	2182	0 (odor)	CDH results, 8/10/76 Aug 18 results, well 32' deep, Sec 14
1/2 mile North North of Highway 2	15	0 (odor)	Aug 18 results, well 45' deep, Sec 22
3/4 mile North 104th & Havana Street	5.3	0 (odor)	Aug 18 results, well 43' deep, Sec 15
1 mile Northwest South of I-76	27	0 (odor)	Aug 18 results, well 35' deep, Sec 15
1/2 mile North along O'Brian Canal	1.0	10	Aug 18 results, well 38' deep, Sec 14
1/2 mile North along O'Brian Canal	< 0.5	0 (odor)	Aug 18 results, well 38' deep, Sec 14
1/2 mile North along O'Brian Canal	< 0.5	0 (odor)	Aug 18 results, well 36' deep, Sec 14
1 1/4 miles North Peoria & O'Brian Canal	55	0 (odor)	July 20 results, well 54' deep, Sec 11
5 miles North East of Potomac Street	5.43 3.4	0 0 (odor)	CDH results, 9/15/76 Jun 15 results, 50' to H <sub>2</sub> O surface
5 miles North East of Chambers Road	0 0.6	0 0 (odor)	CDH results, 9/15/76 Jun 15 results, 20' to H <sub>2</sub> O surface
3 1/4 miles North East of Peoria	10.7 5.7	0 0 (odor)	CDH results, 9/15/76 Jun 16 results, 19' to H <sub>2</sub> O surface

Enclosure 1

Well Location	DIMP CONC. ppb	DCPD CONC. ppb	Remarks
1½ miles North East of Potomac	< 0.5	--	Jun 18 results
1½ miles North East of Potomac	< 0.5	--	Jun 18 results
1 Mile North East of Potomac	12.0	0 (odor)	Sep 17 results, well 260' deep
North of Arsenal on 96th Ave, East of Peoria	57	0 (odor)	Jun 15 results, well 260' deep
North of Arsenal on 96th Ave, East of Peoria	1336 1092	1513 1320	CDH results, 9/16/76 Jun 15 results, well 16' deep
Northwest 3/4 mile, East of Riverdale on 96th Ave	56.5 39	0 0 (odor)	CDH results, 9/16/76 Jun 15 results, 40' to H <sub>2</sub> O surface
1½ mile North East of Peoria	93.3 < 0.5	0 0	CDH results, 9/16/76 Jun 16 results, 55' to H <sub>2</sub> O surface
5 miles North West of Peoria	1.55 2.5	0 0 (odor)	CDH results, 9/15/76 Jun 15 results, 50' to H <sub>2</sub> O surface
4¼ miles North East of Peoria	44 28	0 0 (odor)	CDH results, 9/15/76 Jun 15 results
7 miles North West of Potomac	2.55 2.7	0 0 (odor)	CDH results, 9/16/76 Jun 15 results
	< 0.5	---	Jun 18 results
2 3/4 miles North East of Chambers	19.3 7.6	0 0	CDH results, 9/15/76 Jun 21 results

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Well Location	DIMP CONC. ppb	DCPD CONC. ppb	Remarks
	<0.5	0 (odor)	Mar 22 results
3 miles North East of Peoria	10.4 8.3	0 0	CDH results, 9/15/76 Jun 16 results, 45' to H <sub>2</sub> O surface
	<0.5	0 (odor)	Mar 22 results
3 1/3 miles North West of Havana	56.5 160	0 0	CDH results, 9/15/76 Jun 15 results, 25' to H <sub>2</sub> O surface
2 3/4 miles North West of Havana	7.37 16	0 0 (odor)	CDH results, 9/15/76 Jun 15 results
1 1/4 miles North East of Havana	56.5 3.4	0 0	CDH results, 9/15/76 Jun 16 results, 40' to H <sub>2</sub> O surface
3 3/4 miles North East of Potomac	1.11 <0.5	0 0 (odor)	CDH results, 9/15/76 Jun 15 results
6 miles North West of Chambers	0 <0.5	0 0 (odor)	CDH results, 9/15/76 Jun 15 results
1 1/3 miles West on 96th Avenue	0 0.8	0 0 (odor)	CDH results, 9/16/76 Jun 16 results, 40' to H <sub>2</sub> O surface
1/4 mile West, North of 80th Ave, West of Quebec	0 <0.5	0 0	CDH results, 9/16/76 Jun 16 results, 35' to H <sub>2</sub> O surface
1/8 mile West, North of 80th Ave, West of Piverdale	0 <0.5	0 0	CDH results, 9/16/76 Jun 16 results, 44' to H <sub>2</sub> O surface
1 Mile North East of Potomac	<0.5	0 (odor)	Sep 17 results, well 340' deep

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Well Location	DIMP CONC. ppb	DCPD CONC. ppb	Remarks
5 3/4 miles North West of Potomac	0 < 0.5	0 0 (odor)	CDH results, 9/15/76 Jun 15 results
1 1/4 miles North East of Peoria	70	0	Aug 11 results

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